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10/644,958

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Noriaki Fukiage

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EXAMINER

STOUFFER, KELLY M

ART UNIT

PAPER NUMBER

1762

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

02/16/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

## Office Action Summary

Application No.

10/644,958

Applicant(s)

FUKIAGE, NORIAKI

Examiner

Kelly Stouffer

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 16 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-102 is/are pending in the application.
- 4a) Of the above claim(s) 60-102 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-6, 12-16, 18-23, 28-32, 34-35, 37-39 and 48-59 is/are rejected.
- 7) ☒ Claim(s) 7-11, 17, 24-27, 33, 36 and 40-47 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 2/23/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election with traverse of claims 1-59 in the reply filed on 16 January 2007 is acknowledged. The traversal is on the ground(s) that the subject matter of the two groups is sufficiently related that a search for one would encompass the other and therefore does not present a serious burden to the examiner. This is not found persuasive because the two groups are classified in two different areas, coating methods in 427/569 and apparatus in 118/715. The two groups would require separate searches as they have both acquired separate status in the art and have a different field of search, and therefore presents a serious burden to the examiner. Claims 60-102 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. The requirement is still deemed proper and is therefore made FINAL.

### ***Specification***

2. The disclosure is objected to because of the following informalities: Reference number 117 in Figure 1 is not defined in the specification.

Appropriate correction is required.

**Claim Objections**

3. Claim 1 is objected to because of the following informalities: "tunable etch rate" should be -tunable etch resistant—as defined in the specification. Appropriate correction is required.

**Claim Rejections - 35 USC § 103**

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
4. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 6869542 to Desphande et al. in view of Andosca et al. (J.App. Phys. 72(3) 1 August 1992 pp 1126-1132)

Regarding claim 1, Desphande et al. discloses forming a TERA layer by PECVD on a substrate in a chamber with an RF source coupled to the substrate holder

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(abstract, columns 10-11 lines 63-35). Desphande et al. does not explicitly disclose the details of forming the layer, but describes the etching of the layer in greater detail.

Andosca et al. teaches forming a similar layer by PECVD in a chamber having a plasma source and a substrate holder coupled to an RF source where the RF power applied to the substrate holder encourages deposition of the film (page 1127, Fig 3) in order to use a method that allows control of film quality using substrate bias (page 1126).

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Desphande et al. to include the details of forming the layer by PECVD as taught by Andosca et al. in order to use a method that allows control of film quality using substrate bias.

5. Claims 2-6, 12-16, 18-23, 28-32, 34-35, 37-39 and 48-59 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent number 6869542 to Desphande et al. in view of Andosca et al. as applied above and in further view of US Patent 6635575 to Xia et al.

Regarding claims 2-4, Desphande et al. and Andosca et al. are described above but do not include a translatable substrate holder. Xia et al. teaches an upper electrode of the gas distribution faceplate 13a and the substrate holder is translatable with a gap established in-between (column 4 et seq.), the size of the gap between the gas distribution faceplate and the substrate holder is dependant upon the chamber construction, and is modified depending upon the desired loading and unloading position and wafer thickness (Xia et al. column 4 et seq.) These variables are therefore

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result-effective. Andosca et al. also mentions the importance of mean free path of the gas ions through the gap (page 1127), something a translatable substrate holder would also help to control.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Desphande, et al. and Andosca et al. and as taught by Xia et al. to be able to have different loading and unloading positions and the size of the gap in the claimed ranges absent evidence showing a criticality for the claimed ranges, depending upon the desired loading and unloading positions of the wafer.

Regarding claim 5, Xia et al. discloses depositing both a bottom layer and cap layer (column 23 et seq.). Andosca et al. teaches that refractive index of a layer (and therefore extinction coefficient) is dependant upon substrate bias, substrate temperature and film thickness that varied with reaction conditions (page 1129). One of ordinary skill in the art would be motivated to modify refraction index as implied by Andosca et al. on page 1126 depending upon the desired application of the film. Therefore, it would have been obvious to one of ordinary skill in the art to modify refractive indices and extinction coefficients depending upon the desired application of the film absent evidence showing a criticality for the claimed values.

Regarding claim 6, the bottom layer of Xia et al. has a thickness within the claimed ranges (Table 1).

Regarding claim 12, the claimed deposition rates are in Xia et al. column 11 lines 20-30 and depend upon substrate temperature.

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Regarding claim 13, the deposition time is about the same range as that claimed in Xia et al. when considering the thickness of layers in Table 1.

Regarding claims 14-16 and 18, Xia et al. and Andosca et al. both include the claimed process gases (Xia et al. columns 12-16 et seq. and Andosca et al. page 1127).

Regarding claims 19 and 20, Xia et al. includes a pressure control system in columns 8 and 9 lines 65-18 and pressures in the claimed ranges in Xia et al. column 26 lines 1-10.

Regarding claims 21-22 Andosca et al. includes coupled DC voltages in the claimed ranges (page 1127), which would be coupled to the chuck of Xia et al.

Regarding claim 23, the cap layer of Xia et al. has a thickness in the claimed range (column 26 lines 10-15).

Regarding claims 28-29, the thickness of the capping layer of Xia et al. is crucial to reduce cracks (column 23 lines 15-60). The thickness would depend upon deposition rate and time that would be obvious to modify depending on the thickness desired.

Regarding claims 30-32 and 34-35, the claimed gases and flow rates are in columns 25 and 26 lines 63-15.

Regarding claims 37-39, the depositions can occur in the same or separate chambers in Xia et al. (column 25-26 lines 65-5) and He is used as an ambient (column 8 lines 50-64).

Regarding claims 48, 50, and 52 the substrate holder, chamber, or showerhead is coupled to a temperature control system (column 5 lines 44-50 and column 9 lines 19-40, Xia et al.).

Regarding claims 49, 51, and 53 the temperatures fall within the claimed ranges (columns 11 and 12 et seq., Xia et al.).

Regarding claim 54, the chamber is purged, pressure is low and then raised and a dechucking operation occurs in Xia et al. column 25 et seq.

Regarding claims 55 and 56, the operation comprises oxygen gas in Xia et al. column 25 et seq.

Regarding claim 57, Xia et al. describes depositing two layers of the same material in column 23 and beyond.

Regarding claim 58, it would be obvious to one of ordinary skill in the art that the amount of applied rf power will effect plasma properties, and plasma properties will inherently affect film deposition, and also Andosca et al. shows the effects in the figures.

Regarding claim 59, Xia et al. discloses the plasma formed film harder (less porous and therefore more dense) than the non-plasma formed film that would not have had rf power applied to the substrate holder (column 23 lines 42-60), also see the figures of Andosca et al.

#### ***Allowable Subject Matter***

6. Claims 7-11, 17, 24-27, 33, 36, and 40-47 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.



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The prior art relied on here does not use hydrocarbons as a carbon source, have need of an extra rf source or separate regions on a showerhead, and does not provide for plasma being turned on/off during layer depositions.

### **Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kelly Stouffer whose telephone number is (571) 272-2668. The examiner can normally be reached on Monday - Thursday 7:00-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kelly Stouffer  
Examiner  
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